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Vorrichtung und Verfahren zur Eingabe von Daten

Dispositif et méthode d'introduction de données

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EP-A- 0 324 306
EP-A- 0 326 751
EP-A- 0 476 972

- **IBM TECHNICAL DISCLOSURE BULLETIN. vol. 33, no. 10A, March 1991, NEW YORK US pages 223 - 227 'Algorithm for decreasing the error rate of data entered on a touch-sensitive terminal'**
- **IBM TECHNICAL DISCLOSURE BULLETIN. vol. 33, no. 2, July 1990, NEW YORK US page 53 'Presentation manager touch screen indication'**

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EP 0 513 694 B1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an apparatus and a method for inputting data by utilizing a pattern displayed on the screen of a display unit.

2. Description of the Prior Art

[0002] In an attempt to achieve dimensional reduction in a computer or the like, it has been known heretofore to employ an apparatus where a transparent tablet is stuck onto a display screen and, when a pen is brought down to a key-shaped pattern displayed on the screen, a coordinate signal corresponding to the position of the key is generated from the tablet so that the same effect as depression of the key is attained.

[0003] Fig. 8 shows an example of such apparatus, wherein the function of an electronic desk calculator is displayed on a screen, and an input accepted in accordance with a downward press of a pen to a button region is settled when the pen is lifted up from the same region. In such an apparatus, when the pen is pressed down to one button position for example, the button is displayed as a reversal image. The input is settled in response to a pen-up action while the displayed image is reversed again to the normal state, and the numerical input or input data to be processed is registered.

[0004] In case the input data is to be changed immediately after depressing the button because of an erroneous depression or some other reason, the input can be canceled by dragging the down-position pen to the outside of the button region and then lifting up the pen therefrom.

[0005] In such arrangement, the keyboard portion is displayed on the screen merely at the required time, so that it becomes possible to eliminate the necessity of the space for attaching the keyboard, to consequently form the structure in smaller dimensions. Furthermore, upon erroneous button depression or the like, the input data can be immediately canceled without the need of any particular manipulation to eventually enhance the handling convenience.

[0006] However, in a small-sized electronic notebook or the like, it is requisite to display individual buttons within a limited region due to the relationship to the display area. Particularly when the apparatus is manipulated fast, there may occur a fault that the pen-up region is deviated from the pen-down region by some shake of the user's hand and so forth. In such a case, the input is canceled contrary to the user's intention for execution of the process, and the same manipulation needs to be repeated.

[0007] IBM Technical Disclosure Bulletin, Vol. 33, No. 10A, March 1991, 'Algorithm for decreasing the error rate of data entered on a touch-sensitive terminal', discloses a data input apparatus with a pen wherein a touch-sensitive zone corresponding to a target is included in an expanded visible zone. When the pen leaves the expanded zone while in the down state the touch will be claimed by another touch-sensitive zone to be selected.

OBJECT AND SUMMARY OF THE INVENTION

[0008] It is an object of the present invention to provide an improvement capable of preventing unintentional cancel of input data that may otherwise result from a deviation of a pen-up region from a pen-down region.

[0009] According to one aspect of the present invention, there is provided a data input apparatus as defined in claim 1.

[0010] According to another aspect of the present invention, there is provided a method of inputting data by the use of a pen as defined in claim 7.

[0011] Due to the constitution mentioned, the input data is retained when the pen pressed down to the first region is held within the second region which is wider than the first region, so that if the pen is displaced to the outside of the first region, an unintentional cancel of the input data can be prevented unless the pen is displaced beyond the second region.

[0012] The above and other features and advantages of the present invention will become apparent from the following description which will be given with reference to the illustrative accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 is a block diagram of an exemplary embodiment representing the data input apparatus of the present invention;
Fig. 2 is a flow chart showing the procedure of an operation performed in the apparatus of Fig. 1;
Fig. 3 shows exemplary contents displayed on the screen prior to detection of a pen-down action;
Fig. 4 schematically illustrates a first region;
Fig. 5 schematically illustrates a second region;
Fig. 6 shows a display state where the pen has been pressed down to a button "5";
Fig. 7 shows a display state where the accepted input of the button "5" has been settled; and
Fig. 8 shows exemplary contents displayed on a screen in a conventional apparatus.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] Fig. 1 is a block diagram showing the constitution of an embodiment representing an electronic notebook to which the present invention is applied. In the diagram, an input circuit 1 incorporates a variety of

switches including a power switch, and signals for actuating such switches are supplied thereto from a CPU 4 via an interface 2. A DC voltage obtained by rectifying and smoothing an AC power is supplied to a power circuit 3. The power circuit 3 has a battery 3a therein, and a voltage obtained from an AC power source is used as a system operating voltage. In case no voltage is supplied from the AC power source, the voltage obtained from the battery 3a is used as the system operating voltage.

[0015] To the interface 2, there are connected a tablet 8, a display unit 9 and a loudspeaker 10. Furthermore the CPU 4, a ROM 5, a RAM 6 and a backup memory 7 are also connected thereto via a bus line.

[0016] The tablet 8 is constituted by sticking transparent touch electrodes to a face of the display unit 9, and patterns of buttons or the like visually represented on the display unit 9 are used as input buttons of the tablet 8. When the user touches any pattern such as a button seen through the transparent electrode, a coordinate signal corresponding to the touched portion is supplied to the CPU 4 so that predetermined data is inputted.

[0017] In this manner, the tablet is so formed as to generate a coordinate signal corresponding to the portion touched by the user. For generation of such a signal, it is possible to employ either a pressure sensitive type which generates a signal in accordance with a variation in the pressure, or a capacitance type which generates a signal in accordance with a variation in the static capacitance.

[0018] Fig. 2 is a flow chart showing the procedure of a button tracing operation performed in the apparatus where the present invention is applied. In the process of the flow chart, the operation is started when the pen has been pressed down to a desired button (in an undermentioned first region). As shown at step 100 in Fig. 2, a first region for recognizing a pen-down action is set with respect to the entire buttons, i.e., a display region is set for each button illustrated in Fig. 3. Taking a button "5" here as an example, the first region for this button is substantially rectangular as represented by a thick line in Fig. 4, and is defined by coordinates (x1, Y1) at the upper left corner and coordinates (x2, y2) at the lower right corner.

[0019] Subsequently at step 101, a second region for recognizing a pen-up action is set with respect to each of the buttons already set at step 100. As illustrated in Fig. 5, the second region includes the first region and is greater in area than the first region by a width w. The second region is shaped into a substantially rectangular pattern defined by coordinates (x3, y3) at the upper left corner and coordinates (x4, y4) at the lower right corner.

[0020] Next at step 102, a flag in each button is initialized (f = 0). In this state, a process of accepting a pen-down action is executed at step 103, where a decision is made to discriminate between a pen-down action and a pen-up action, and the coordinates (x, y) thereof are detected. In this case, the coordinates (x, y) are judged to be in which of the button regions set at step 100. (Coordinate detecting means)

[0021] The result of the detection at step 103 is decided at step 104. When the result of such decision signifies a pen-down action, a further decision is made at step 105 as to whether the coordinates detected at step 103 are within the pen-up region, i.e., the second region.

[0022] If the result of the decision at step 105 signifies that the pen-down coordinates are within the second region, another decision is made as to whether the flag is 0 or not. Since the flag has already been initialized at step 102, the flag is judged here to be 0. Therefore, at step 107, the flag is set to 1.

[0023] Then the displayed image of the button in the pen-down region (first region) is turned to a reversal image at step 108, and the operation returns to step 103. The state of the pen at this moment is detected at step 104, and if the pen-down action is continuously maintained, such state is judged at step 104. Thereafter a decision is made at step 105 as to whether the pen is still within the button-up region or not.

[0024] Fig. 6 illustrates the displayed content in the stage of the operation mentioned. In this embodiment, there is shown an exemplary state where the button "5" is depressed and displayed as a reversal image.

[0025] Subsequently a decision is made at step 106 as to whether the flag is 0 or not. Since the flag has already been set to 1 at step 107, the flag is judged to be not 0 at this time, so that the operations returns to step 103. In this case, the displayed content remains unchanged.

[0026] During the continuous pen-down state, if the result of the decision signifies that the coordinates corresponding to the pen-down position at step 105 are outside the button-up region (second region), a further decision is made at step 115 as to whether the flag 1 is 1 or not. Since the flag is 1 at this moment as mentioned, the flag is set to 0 at step 116, and the state of the displayed content is reversed at step 108.

[0027] The displayed content is reversed to the former state of Fig. 3 by clearing the reversal display of the input data. This process is relevant to a manipulation performed when the input data is to be canceled because, for example, the pen was displaced to any position outside the first-depressed button region due to an accidental slip of the user's hand, or the data was inputted by an erroneous depression or the like. Even in such condition, the input of the preceding button can be accepted by reverting the pen from the down-position thereof to the former button-up region (second region).

[0028] Upon acceptance of the proper input, the user performs a pen-up action by lifting the pen upward from the tablet. Since the flag is set to 1 at step 107 in case the proper input is accepted, the flag is judged to be 1 at step 120, and then the displayed button is turned to a reversal image at step 121.

[0029] More specifically, the reversal image obtained by the pen-down action is reversed again to the former

state, whereby the reversal display is cleared. The depression of the button is recognized through such process and, as shown in Fig. 7, the displayed image of the button "5" is reversed to the former state, while the accepted input data "5" is settled and displayed in the window 21.

[0030] Meanwhile, when the pen is shifted to any position outside the second region, the flag is set to 0 at step 116, so that if the pen is lifted up in such a state, the flag is judged to be not 1 at step 120 (deciding means). Accordingly the result of the decision signifies that no button has been depressed at this moment.

[0031] The description given above can be summarized as follows.

[0032] Upon detection of a pen-down action to the first region of a desired button, a decision is made as to which button has been depressed, and the depressed button (first region) is displayed as a reversal image. In case any wrong button is displayed due to an erroneous depression or insufficient detection precision, the input manipulation can be canceled by first shifting the pen from the down-position to the outside of the second region and then lifting up the pen therefrom.

[0033] Even if the pen is accidentally displaced to the outside of the first region by some shake of the user's hand or the like, the selected input is retained effective unless the pen is displaced beyond the second region which is dimensionally greater than the first region. And even when the reversal image of the button is deleted with a displacement to the outside of the second region, the reversal image of the button is displayed again by reverting the pen to the first region while holding the pen in its down-state, whereby the input is accepted.

[0034] If the pen is lifted up with the input accepted, the reversal display of the button is deleted, and the input from the button is settled. At this time, even if the pen is positioned outside the first region, the input is processed as effective data unless the pen is further displaced outside the second region, so that there never occurs an unintentional cancel of the input.

[0035] According to the present invention, as described hereinabove, the input data is retained, in response to the detection of a pen-down action to a desired pattern, in the area wider than the pen-down region. Therefore, even in an apparatus having a small-sized display device, unintentional cancel of the input is hardly induced to consequently achieve an advantage of facilitating accurate input of data, whereby it is rendered possible to attain faster manipulation of the apparatus.

Claims

1. A data input apparatus with pen means comprising:

   a pen for selectively indicating and inputting (1) desired data;

   a display unit (9) for displaying an image of the input data;

   a tablet (8) for obtaining coordinate data by indicating with said pen the position corresponding to a predetermined portion of a pattern displayed on said display unit (9);

   means (2, 4) for detecting the coordinate data in response to a downward press of said pen to said tablet (8), and further detecting the coordinate data in response to an upward lift of said pen from said tablet (8);

   means for setting a first region of a predetermined area in said tablet (8), and also setting a second region which includes said first region and has an area greater than that of said first region; and

   deciding means for accepting the input data in response to a downward press of said pen to said first region and thereafter settling said input data in response to an upward lift of said pen from said second region,

   characterized in

   that said deciding means accepts the input data in case the pen has been moved outside of the second region and then reverted in the down-state to the first region.

2. The apparatus according to claim 1, wherein said tablet (8) is superposed on said display unit (9) in such a manner that the displayed image on said display unit (9) is rendered visible through said tablet (8).

3. The apparatus according to claim 1 or 2, wherein said deciding means is so formed as not to execute said data settling process if said pen is lifted upward from any position outside said second region after the input data is accepted with the downward press of said pen to said first region, and said means executes a predetermined process without any indication of data by said pen.

4. The apparatus according to anyone of claims 1 to 3, wherein said predetermined portion is displayed in the shape of a key on said display unit (9), and said first region is so set as to be equal to said key-shaped portion.

5. The apparatus according to claim 4, further having display control means which controls the display state in such a manner that the displayed image of said key is reversed when said input data is accepted from said deciding means, and is reversed again to the former state when said input data is settled.

6. The apparatus according to anyone of claims 1 to 5, wherein said apparatus is a small-sized portable

computer.

7. A method of inputting data by the use of a pen for selectively indicating and inputting (1) desired data, a display unit (9) for displaying an image of the input data, and a tablet (8) for obtaining coordinate data by indicating with said pen the position corresponding to a predetermined portion of a pattern displayed on said display unit (9), said method comprising the steps of:

detecting the coordinate data in response to a downward press of said pen to said tablet (8);
deciding, in accordance with the result of such detection, that the indication signifies a first region corresponding to the position where a desired key is displayed on said display unit (9);
detecting the coordinate data in response to an upward lift of said pen from said tablet (8);
deciding whether said pen has been lifted up from a second region which includes said first region and has an area greater than that of said first region; and, if so,
settling and accepting the input data,

characterized by the step
of accepting the input data in case the pen has been moved outside of the second region and then reverted in the down-state to the first region.

Patentansprüche

1. Dateneingabe-Vorrichtung mit Eingabestiftmittel, die umfaßt:

einen Eingabestift zum selektiven Angeben und Eingeben (1) gewünschter Daten,
eine Anzeigeeinheit (9) zum Anzeigen eines Bildes der Eingabedaten,
ein Eingabegerät (8) zum Gewinnen von Koordinatendaten durch Angeben der Position, die einem vorbestimmten Teil eines auf der Anzeigeeinheit (9) angezeigten Musters entspricht, mit dem Eingabestift,
ein Mittel (2, 4) zum Erfassen der Koordinatendaten in Reaktion auf ein Niederdrücken des Eingabestifts auf das Eingabegerät (8) und ferner zum Erfassen der Koordinatendaten in Reaktion auf ein Abheben des Eingabestifts von dem Eingabegerät (8),
ein Mittel zum Setzen eines ersten Bereichs einer vorbestimmten Fläche in dem Eingabegerät (8) und außerdem zum Setzen eines zweiten Bereichs, der den ersten Bereich enthält und eine Fläche hat, die größer als diejenige des ersten Bereichs ist, und
ein Entscheidungsmittel zum Annehmen der Eingabedaten in Reaktion auf ein Niederdrükken des Eingabestifts auf den ersten Bereich und danach Halten der Eingabedaten in Reaktion auf ein Abheben des Eingabestifts von dem zweiten Bereich,

dadurch **gekennzeichnet**,

daß das Entscheidungsmittel die Eingabedaten in dem Fall annimmt, in dem der Eingabestift aus dem zweiten Bereich heraus bewegt und dann in den abgesenkten Zustand zu dem ersten Bereich zurückgebracht worden ist.

2. Vorrichtung nach Anspruch 1, bei der das Eingabegerät (8) der Anzeigeeinheit (9) in einer Weise überlagert ist, daß das auf der Anzeigeeinheit (9) angezeigte Bild durch das Eingabegerät (8) sichtbar gemacht wird.

3. Vorrichtung nach Anspruch 1 oder 2, bei der das Entscheidungsmittel derart beschaffen ist, daß der Datenhalteprozeß nicht ausgeführt wird, wenn der Eingabestift aus irgendeiner Position außerhalb des zweiten Bereichs abgehoben wird, nachdem die Eingabedaten mit dem Niederdrücken des Eingabestifts auf den ersten Bereich angenommen sind, und das Mittel einen vorbestimmten Prozeß ohne irgendeine Angabe von Daten durch den Eingabestift ausführt.

4. Vorrichtung nach einem der Ansprüche 1 bis 3, bei der der vorbestimmte Teil in Form einer Taste auf der Anzeigeeinheit (9) angezeigt wird und der erste Bereich so gesetzt wird, daß er dem tastenförmigen Teil gleich ist.

5. Vorrichtung nach Anspruch 4, die ferner ein Anzeigesteuermittel hat, das den Anzeigezustand in einer Weise steuert, daß das angezeigte Bild der Taste umgekehrt dargestellt wird, wenn die Eingabedaten von dem Entscheidungsmittel angenommen sind, und wieder in den früheren Zustand zurückversetzt wird, wenn die Eingabedaten gehalten werden.

6. Vorrichtung nach einem der Ansprüche 1 bis 5, wobei die Vorrichtung ein tragbarer Rechner mit kleinen Abmessungen ist.

7. Verfahren zum Eingeben von Daten unter Benutzung eines Eingabestifts zum selektiven Angeben und Eingeben (1) gewünschter Daten, einer Anzeigeeinheit (9) zum Anzeigen eines Bildes der Eingabedaten und eines Eingabegeräts (8) zum Gewinnen von Koordinatendaten durch Angeben der Position, die einem vorbestimmten Teil eines auf der Anzeigeeinheit (9) angezeigten Musters entspricht,

mit dem Eingabestift, welches Verfahren Schritte umfaßt zum

Erfassen der Koordinatendaten in Reaktion auf ein Niederdrücken des Eingabestifts auf das Eingabegerät (8),
Entscheiden in Ubereinstimmung mit dem Ergebnis einer solchen Erfassung, daß die Angabe einen ersten Bereich andeutet, welcher der Position entspricht, wo eine gewünschte Taste auf der Anzeigeeinheit (9) angezeigt wird,
Erfassen der Koordinatendaten in Reaktion auf ein Abheben des Eingabestifts von dem Eingabegerät (8),
Entscheiden, ob der Eingabestift von einem zweiten Bereich abgehoben worden ist, der den ersten Bereich enthält und und eine Fläche hat, die größer als diejenige des ersten Bereichs ist, und falls dies der Fall ist,
Halten und Annehmen der Eingabedaten,

gekennzeichnet durch den Schritt zum

Annehmen der Eingabedaten in dem Fall, in dem der Eingabestift aus dem zweiten Bereich heraus bewegt und dann in den abgesenkten Zustand zu dem ersten Bereich zurückgebracht worden ist.

Revendications

1. Appareil d'entrée de données muni d'un moyen de crayon, comprenant :

un crayon pour indiquer et entrer sélectivement (1) des données souhaitées ;
une unité d'affichage (9) pour afficher une image des données d'entrée ;
une tablette (8) pour obtenir des données de coordonnées en indiquant à l'aide dudit crayon la position correspondant à une partie prédéterminée d'un motif affiché sur ladite unité d'affichage (9) ;
un moyen (2, 4) pour détecter les données de coordonnées en réponse à une pression vers le bas dudit crayon sur ladite tablette (8) et pour détecter de façon supplémentaire les données de coordonnées en réponse à un relèvement vers le haut dudit crayon depuis ladite tablette (8) ;
un moyen pour établir une première région d'une aire prédéterminée dans ladite tablette (8) et également pour établir une seconde région qui inclut ladite première région et qui présente une aire supérieure à celle de ladite première région ; et
un moyen de décision pour accepter les données d'entrée en réponse à une pression vers le bas dudit crayon sur ladite première région et pour ensuite constituer lesdites données d'entrée en réponse à un relèvement vers le haut dudit crayon depuis ladite seconde région,

caractérisé en ce que :

ledit moyen de décision accepte les données d'entrée dans le cas où le crayon a été déplacé à l'extérieur de la seconde région puis est revenu dans l'état d'abaissement sur la première région.

2. Appareil selon la revendication 1, dans lequel ladite tablette (8) est superposée sur ladite unité d'affichage (9) de telle sorte que l'image affichée sur ladite unité d'affichage (9) soit rendue visible au travers de ladite tablette (8).

3. Appareil selon la revendication 1 ou 2, dans lequel ledit moyen de décision est formé de manière à ne pas exécuter ledit processus de constitution de données si ledit crayon est relevé vers le haut depuis une quelconque position à l'extérieur de ladite seconde région après que les données d'entrée sont acceptées tandis que la pression vers le bas dudit crayon sur ladite première région est réalisée, et ledit moyen exécute un processus prédéterminé sans une quelconque indication de données à l'aide dudit crayon.

4. Appareil selon l'une quelconque des revendications 1 à 3, dans lequel ladite partie prédéterminée est affichée selon la forme d'une touche sur ladite unité d'affichage (9) et ladite première région est établie de manière à être égale à ladite partie en forme de touche.

5. Appareil selon la revendication 4, comportant en outre un moyen de commande d'affichage qui commande l'état d'affichage de telle sorte que l'image affichée de ladite touche soit inversée lorsque lesdites données d'entrée sont acceptées à partir dudit moyen de décision, et soit inversée à nouveau pour être retournée dans l'état précédent lorsque lesdites données d'entrée sont constituées.

6. Appareil selon l'une quelconque des revendications 1 à 5, dans lequel ledit appareil est un ordinateur portable de petite dimension.

7. Procédé d'entrée de données en utilisant un crayon pour indiquer et entrer sélectivement (1) des données souhaitées, une unité d'affichage (9) pour afficher une image des données d'entrée et une tablette (8) pour obtenir des données de coordonnées en indiquant à l'aide dudit crayon la position corres-

pondant à une partie prédéterminée d'un motif affiché sur ladite unité d'affichage (9), ledit procédé comprenant les étapes de :

détection des données de coordonnées en réponse à une pression vers le bas dudit crayon sur ladite tablette (8) ;
décision, conformément au résultat de cette détection, du fait que l'indication signifie une première région qui correspond à la position où une touche souhaitée est affichée sur ladite unité d'affichage (9) ;
détection des données de coordonnées en réponse à un relèvement vers le haut dudit crayon depuis ladite tablette (8) ;
décision de si ledit crayon a été relevé depuis une seconde région qui inclut ladite première région et qui présente une aire supérieure à celle de ladite première région et s'il en est ainsi,
constitution et acceptation des données d'entrée,

caractérisé par l'étape de :

acceptation des données d'entrée dans le cas où le crayon a été déplacé à l'extérieur de la seconde région puis a été ramené dans l'état d'abaissement sur la première région.

FIG. 1

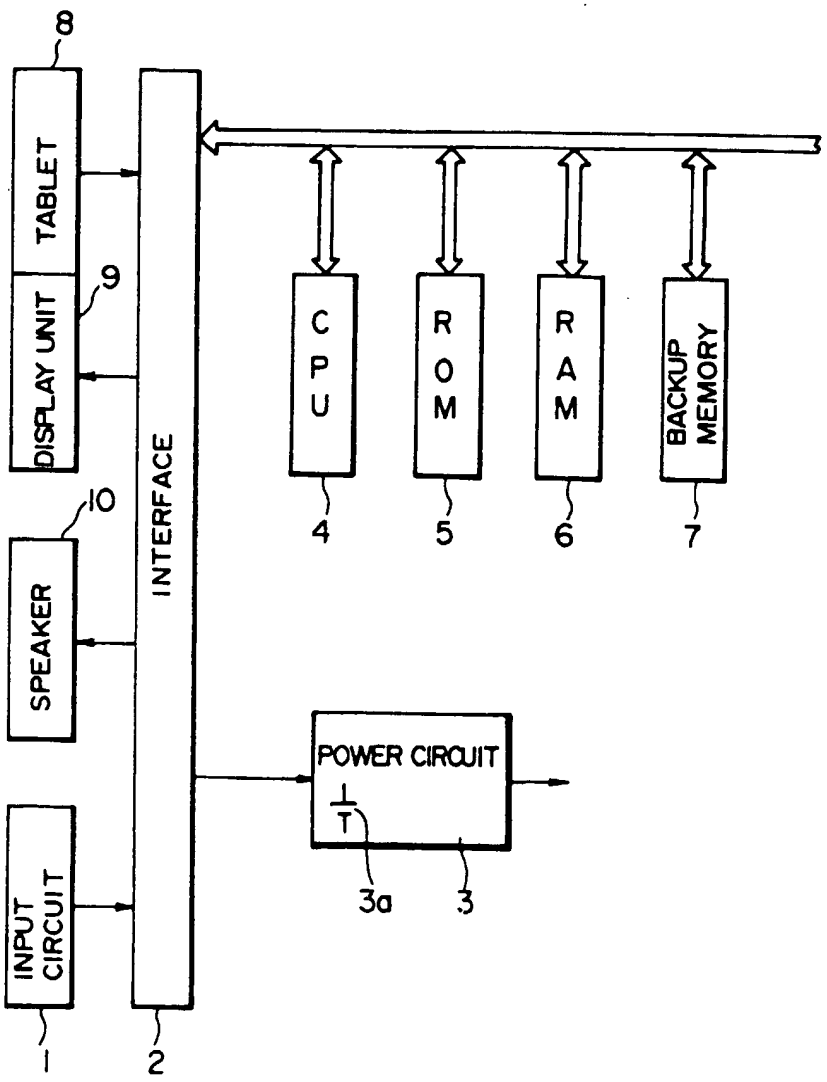
8
TABLET
9
DISPLAY UNIT
10
SPEAKER
INPUT CIRCUIT
1
INTERFACE
2
3
CPU
4
ROM
5
RAM
6
BACKUP MEMORY
7
POWER CIRCUIT
T
3a
3

FIG. 2

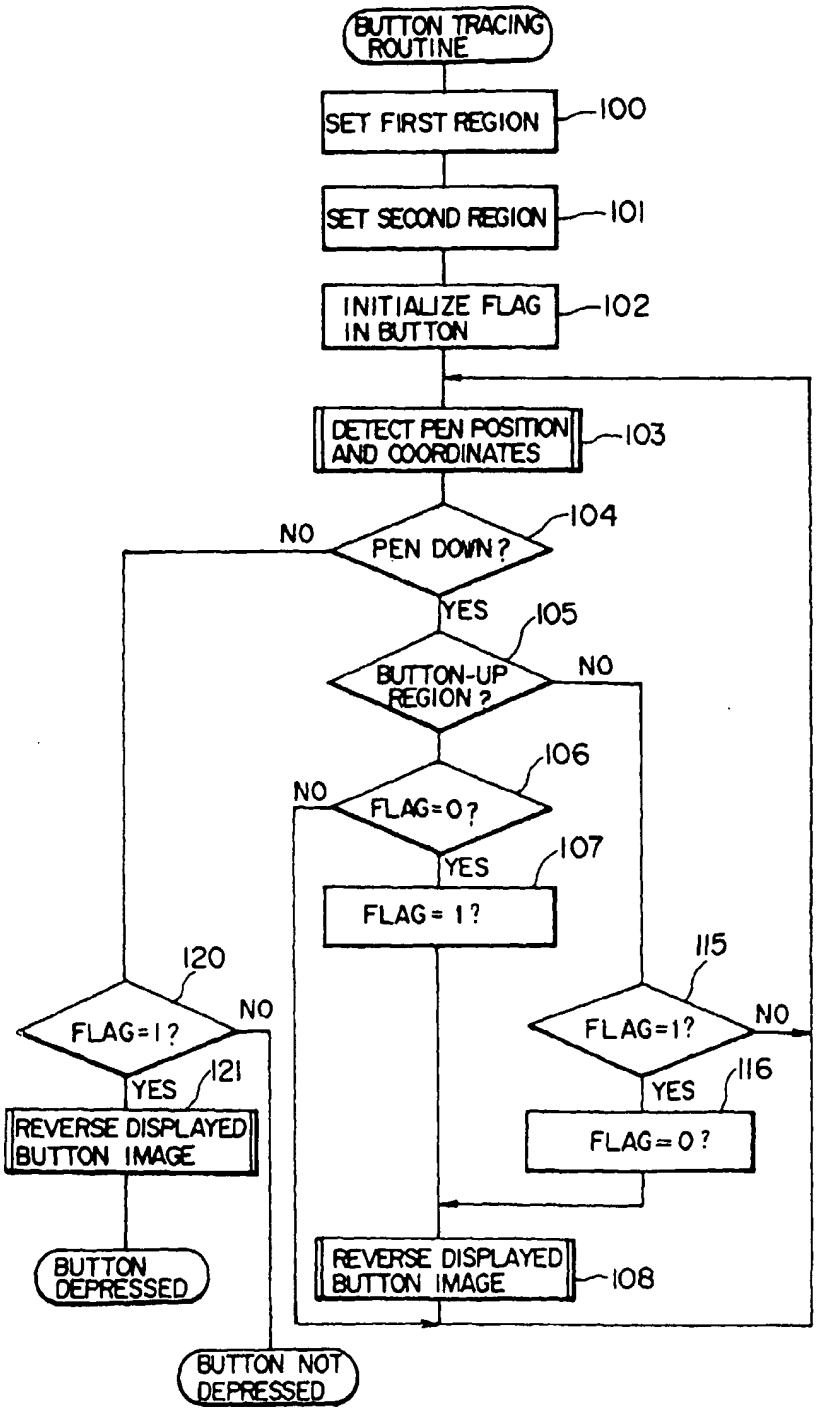
BUTTON TRACING ROUTINE
SET FIRST REGION
100
SET SECOND REGION
101
INITIALIZE FLAG IN BUTTON
102
DETECT PEN POSITION AND COORDINATES
103
PEN DOWN?
104
NO
YES
BUTTON-UP REGION ?
105
NO
FLAG=0?
106
NO
YES
FLAG=1?
107
FLAG=1?
120
NO
YES
121
REVERSE DISPLAYED BUTTON IMAGE
BUTTON DEPRESSED
BUTTON NOT DEPRESSED
FLAG=1?
115
NO
YES
116
FLAG=0?
REVERSE DISPLAYED BUTTON IMAGE
108

FIG. 3

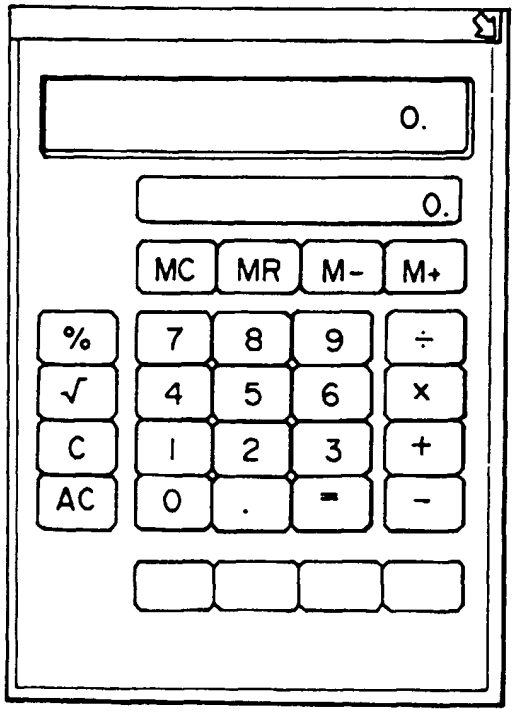

FIG. 4

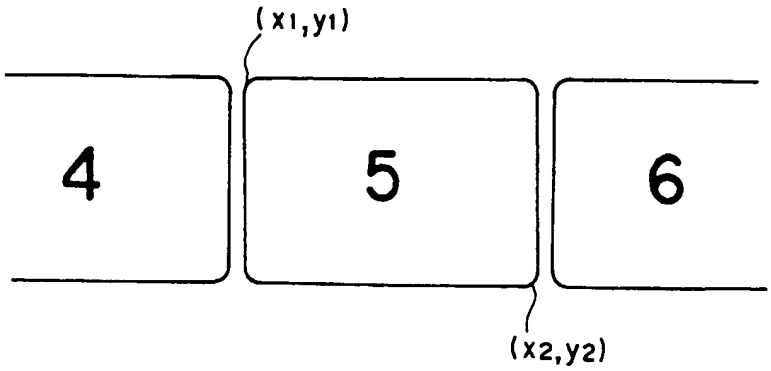

FIG. 5

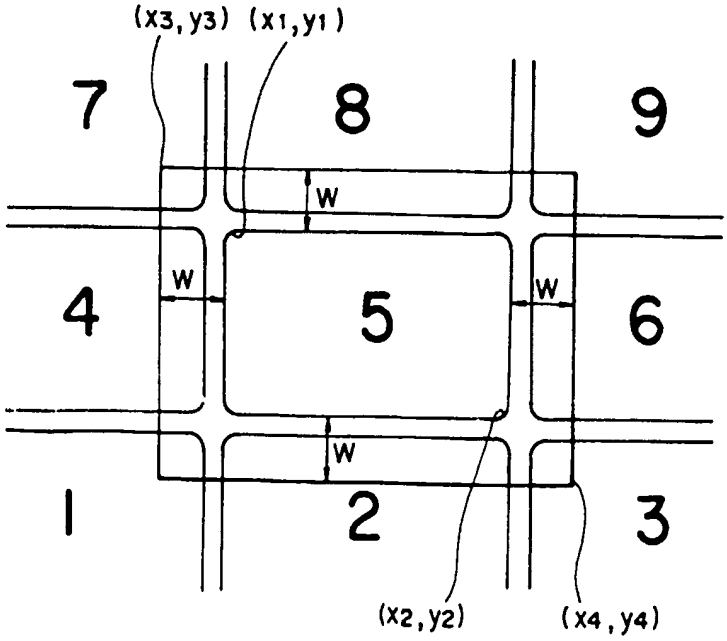

FIG. 6

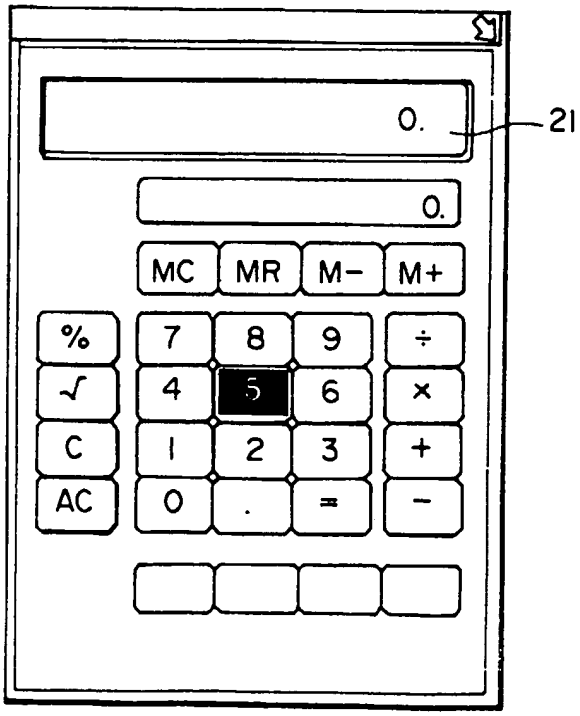

FIG. 7

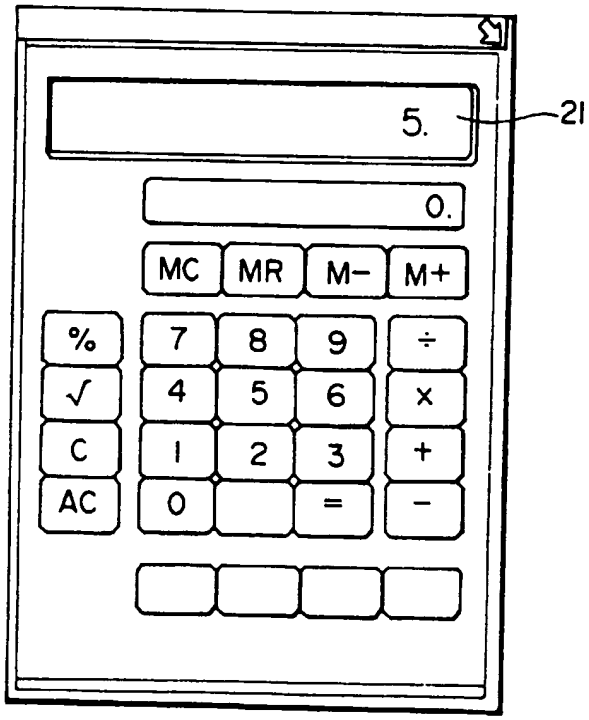
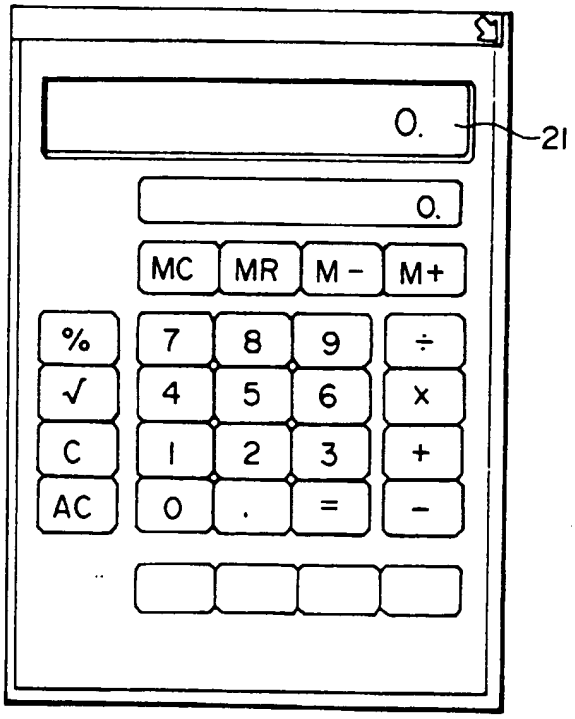
FIG. 8